

# Assessment of Technological Capability in Iranian Automotive Industries through Developing the Model

Abbas Khamseh<sup>1</sup>, Mohammad Mohagheghi<sup>2</sup>

<sup>1</sup>Department of Industrial Management, Karaj Branch, Islamic Azad University, Karaj, Iran; <sup>2</sup>Department of Management, Science and Research Branch, Islamic Azad university, Karaj, Iran

## Abstract

Major factor in the failure to apply technology for competitive advantage in enterprises in developing countries is a lack of knowledge of the firms technological capability level and their use in comparative advantage. The importance of technology development has caused senior managers of the company to identify and evaluate the capabilities of their organizations, and with the parallel to the detection of technological development in the world and monitoring efforts of competitors to gain access to the new technology and take steps toward improving the technological capabilities of the organization. On the other hand, the evaluation is one of the key tools in an environment of the technology management that utilizes this tool to identify the strength and improvable points with the aim to measure technological gap of the technology. In this study, we have tried by using existing theoretical models of technological capability assessment, present developed and native technology assessment model for the automotive industry of Iran including Mega motor company that is one of the major partners in automotive industry, and then based on developed model, we evaluated the technological capabilities of the Mega motor company.

**Keywords:** technology, technology assessment, technological capabilities

## Introduction

Technology has always been seen as an enhancing human capabilities and in the creation of appropriate tools, from the invention of the wheel to make the super conductors, it helps people (Nasirzadeh, 1991). Nowadays, with the increasing trend of industrial, economic, technological development and with disappearing geo-

graphical boundaries, there is an intense competition in the production and service delivery, technological growth is one the vital strategic objectives of executives in organizations. As the development of technology and economic development in an organization is directly related, so the level and extent of the company's technology development is as a sign of authority. Achieving related technology is required to develop technology, and then promote it (Tabatabaeeian, and Habib, 2005).

Companies and manufacturing enterprises are often involving large administrative issues such as buying, selling, supplying raw materials, accounting matters, and insurance as well as drastic changes in the competitive environment. Therefore, to remain on the competition arenas, organizations must inevitably turn to the evolution of technology and the creation of advanced technologies. But the question arises is whether, in the path of obtaining technologies, the best way to reduce the technological gap which is the best way to reduce the technological gap. (Jafari Nejad, 1995)

Technology assessment for managers of firms has always been a major challenge. This is especially needs to consider that most of the countries are consumer in spite of being the creator of technology (Rnasy, 2011). The use of models and methods for technology assessment is not working long in this business. In other words, managers and technical experts of the companies and factories due to the gained experience are mentally able to determine the ability of companies in various fields of technology. It seems technological capability models to be the right tool to Confirm and authenticate mental estimates. Experience shows that the models and methods that are used in such factories should have two basic properties: First, it should be simple and understandable, and secondly, in a short time give an acceptable result. On the other hand, technology assessment and auditing

**Corresponding author:** Abbas Khamseh, Department of Industrial Management, Karaj Branch, Islamic Azad University, Karaj, Iran. E-mail: [Khamseh1349@gmail.com](mailto:Khamseh1349@gmail.com)

is one of the tasks of strategic managers, According to the environmental conditions and their capabilities and abilities and also to assess the weaknesses do necessary strategies and policies for the growth of the goals of the organization. (Tabatabaeeian, 2005)

## Review of literature

Technology is known ‘‘as systematic knowledge in producing a product or service in industry, agriculture, and trade as well as the installation or maintaining an industrial plant or equipment , or to manage an industrial company’’(WIPO, 2010)

Technology capability assessment is a process in which the current level of capabilities and technological abilities of organization is measured to identify the strength and improvable points and also to compare the technological capabilities of competitors or ideal level, or technological gap (Putranto *et al.*, 2003)

Since different models have been developed and models that are used in the company should have two basic properties, firstly, simple and understandable, secondly, offer results in a short and acceptable time.

Khamseh (2011) classify the models to evaluate the technological capabilities to other categories as is shown in Table 2. (Khamseh, 2011).

**Table 1: Classification of views and models of technological capability assessment at the firm level**

<b>Scheduling</b>	<b>Models to determine the technology gap</b>	<b>Models to determine the cause of gaps</b>	<b>Models present solutions to compensate for the backwardness</b>
<b>Areas of application</b>			
Assessment of technological capabilities at the firm level and communication Technology products	Management Technology needs model		Phaal model Management technology needs model
Assessment of firm-level Technological capabilities and communication with process technology	Porter's model Panda and Ramanatan model	Lindsay model Ford Model	Assessment model Lin model Garcia – Arreola model Model of management information systems Science and technology
Assessment of technological capabilities in ultra-firm level	Atlas of Technology Model		

**Table 2: Classification of models of firm-level technological capability assessment (Khamseh, 2011)**

<b>Models to determine the technological gap</b>	<b>models to assess the Causes of the technological gap</b>	<b>Models provide a mechanism to compensate for the technological gap</b>
Atlas of Technology Model		
Porter's model	Ford Models	Ford Models
Panda and Ramanatan model	Lindsay model	Lindsay model
Floyd model	Atlas of Technology Model	phaal Model
Management technology needs model	Floyd models	Garcia – Arreola model
Technology assessment content model	Management Technology needs model	Lin model
Technology Status assessment Model	Model of Technological capabilities	Technology Needs Assessment Model
Economic value added model		Science and Technology Management Information System Model
		Management technology needs Model

In assessing the technological capabilities of all corporate functions that have an add value are examined and its technologies ate investigated in terms of the ability of the firms. Assessment of the technology's capability to create value-added and existing technological gaps at the level of the capa-

bility of the company compared to competitors, and explains the causes of the gap and offer solutions for the compensation of the gap. It also helps the organization express the key potential to the extent of the firm's ability to use and exploit the technology in line with the firm's strategy.

The national capability assessment models also include:

- UNDP model [United National Development Program(UNDP)]

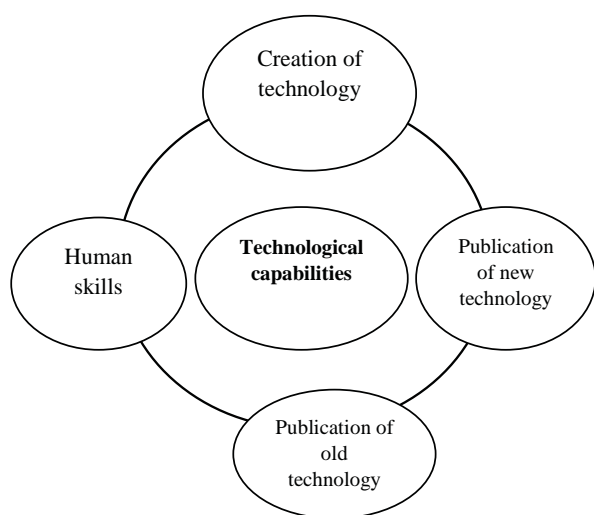
The technical aspects of this model are classified into four categories as shown in Figure 1. The dimensions of all countries are related to technology policy goals. These four dimensions are: (Tabatabaeeian, 2011)

1- Creating technology: It is not necessary that all countries are on the edge of technology, but all of them require adequate capacity for innovation. The ability to be innovative in the use of technology cannot be without the ability to localize products and processes with Aboriginal status are fully extended.

2- Diffusion of new technologies: All countries have their own innovations to take advantage of opportunities to adapt the network age.

3- Publishing old technology: Accumulation process is the advancement of technology and the wide dissemination of the older technology is essential for the adoption of newer technologies.

4- Human skills: People also need to have skills in human visitor and user of technology. Today's technology requires acclimation and the foundation of such these abilities is basic education for developing cognitive skills, and skills in science and mathematics.

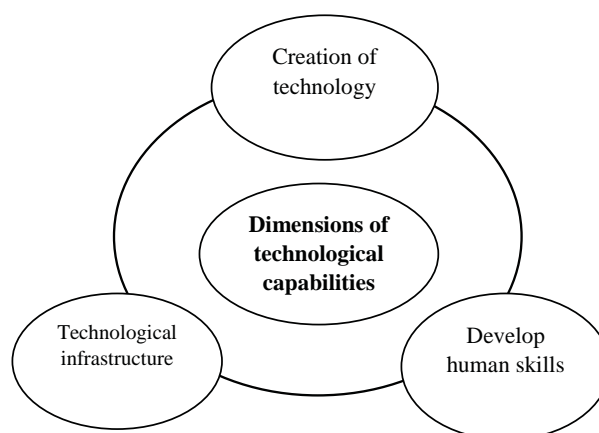


**Figure1: Technology capability assessment, UNDP model**

- Arco Model

Three aspects of this model are: Creating technology, infrastructure technology and human skills development. This model is based on reports of other models such as the United Nations technology acquisition model, World Economic Forum, RAND model as well as some other in-

ternational authoritative reports. Changes and improvements have been made in that case (Archibugi and Coco, 2004). Figure 2 shows the capabilities of the Arco model.



**Figure 2: Arco's Model of assessment of technological capabilities**

- Lall Model

According to the analytical mute model, the framework of evaluating technological capabilities at the national level includes three dimensions, which are: technological capabilities, incentives and institutional conditions (Lall, 1992). The structure of Lull model is based on the three dimensions in Figure 3.

## Objectives, methods and research questions

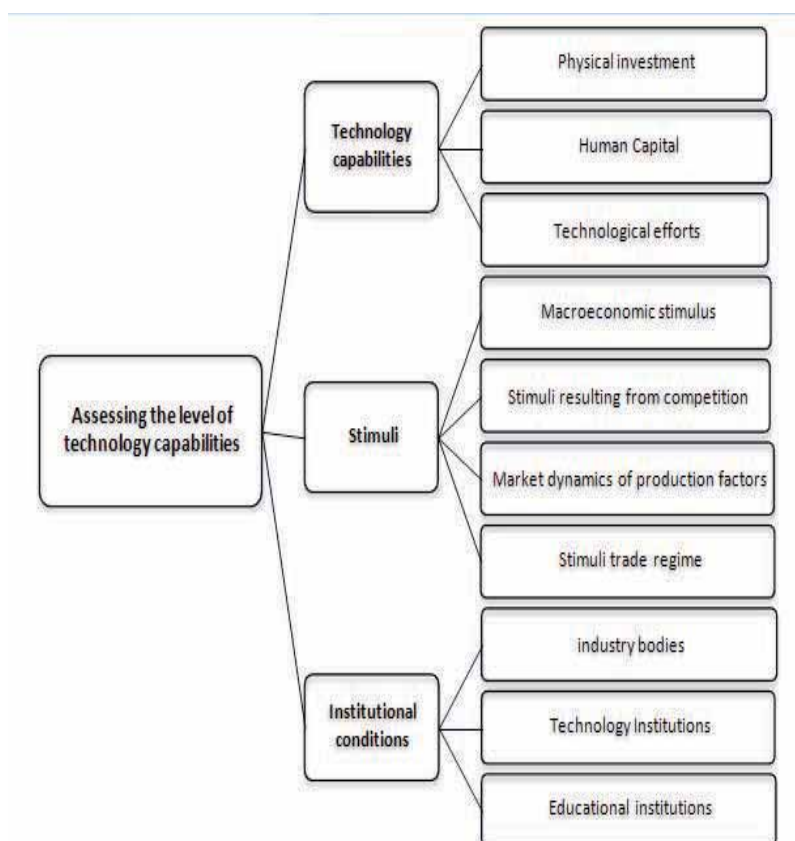
This study aims to determine the capabilities of technological Mega Company and through it, this study wants to determine its existing technological gaps in each level to determine. The purpose of this study as a research method is applied. The research questions are:

1- What is the proposed model which is developed to assess the level of technological capabilities in the industry?

2- At what level are Mega technological capabilities based on a developed model, and to what extent is the gap in the capabilities of each company relative to the optimum level?

## Statistical population

Top and middle managers and industry experts with experience of working with undergraduate and graduate degrees higher than a year as experts form the survey of this statistical society. A survey was specified according to the period of the study and also by using the Cochran test conditions.



**Figure 3: Lull's Model of technological capability assessment**

**Table 3: Academic profile and experience of those who have completed the questionnaire.**

Education	Numbers	Percentage of total
Bachelor	16	41.03
master	19	48.72
PHD	4	10.26
total	39	100.00

## Results

### *The findings of the first question*

By comparing models to assess the ability of the firm, share of them are summarized in Table 4.

Also by comparing models to assess national capabilities in technology, sharing of them were summarized in Table 5.

According to the above tables and also applying some country-specific variables, the model developed to evaluate the capabilities of the technology industry in Iran were drawn as shown in Figure 4. According to this model, the technologi-

cal capabilities of the automotive industry will be influenced by two sets of variables, the first batch is variables within the firm, and the second are national-level variables.

Based on the model developed, the indicators and the questionnaire were designed to study the judgment of experts and its reliability and validity was confirmed by Cronbach's alpha coefficient 0.89.

### *The findings of the second question*

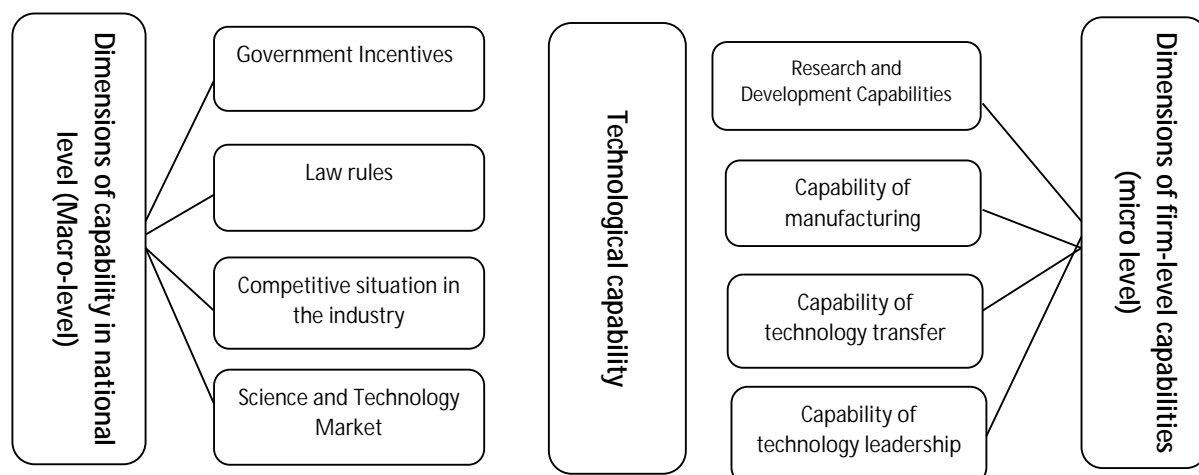
**According to data** collected by questionnaire, the level of technological capability available for each of the dimensions of the new capability for the entire technological capabilities is in Table 6. To determine the optimal level of technological capabilities during an interview with senior experts, the desired level of organizational maturity, were determined as 75% by the results in Table 6 and Figure 1. As can be seen the minimum gap is related to production capabilities, and the largest gap is belonging to the dimensions of law rules and competition in the industry.

**Table 4: Comparison of technological capabilities models at the firm level.**

Capabilities of the technology	Phaal model	management technology needs model	Model of technological capabilities	Panda and Ramanatan model
Knowledge / Search / Identification	√	√	√	
Acquisition	√	√		√
Apply, interest, and attract	√	√	√	
Evaluation and Selection (Select)	√	√		
Manufacturing			√	√
Engineering Design and R & D			√	√
Support and maintenance			√	√
Core competences		√		
Technology strategy		√		
Learning		√		
External links and incentives		√		
Creativity				√
Marketing and Sales				√
After Sales Service				√
Leadership				√
Protection	√			

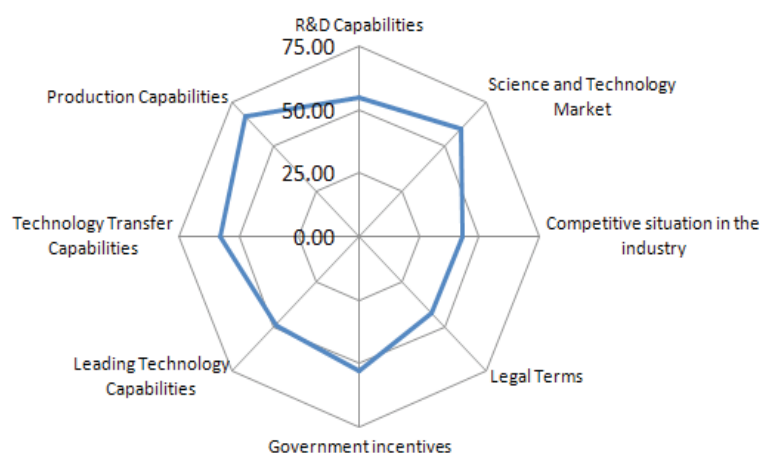
**Table 5: Comparison of models of technological capabilities at the national level**

Dimensions of technological capabilities	UNDP	Arco	Lall
Creation of technology / technological efforts	√	√	√
publication of new and old technology	√		
Human skills	√	√	√
Technology infrastructure		√	√
Economic incentives / market / competition / trade regime			√
Competition stimuli			√
Industrial institutions / Technology / Training			√

**Figure 4: The model developed to evaluate the capabilities of automotive technology**

**Table 6: Existing technological capabilities of the company and comparing it with the desired level**

Main dimensions	Sub-dimensions	Dimensions the current status (percent)	Average of the main Dimensions (percent)	gap towards the desired level of 75%
Firm level capabilities	Research and Development Capabilities	54.76	56.41	20.24
	Capability of manufacturing	67.50		7.50
	Capability of technology transfer	57.84		17.16
	Capability of technology leadership	49.25		25.75
Capability in national level	Government Incentives	53.11	50.15	21.89
	Law rules	42.57		32.43
	Competitive situation in the industry	42.95		32.05
	Science and Technology Market	60.00		15.00
Total technological capability		53.88		16.12

**Figure 5: Comparison of existing technological capabilities with a desired level**

## Conclusion

Assessment of technological capabilities is one of the key tools in the environment of technology management that the corresponding literature has been during the past years, the main use of this tool is to identify the technological strength and weaknesses which aimed at measuring the technological gap of technology. Based on that we attempted to develop a technological strategy and plan, however, major development of literature on this subject is at the firm level, but nationally ranked in the category of technology to develop countries, industrial relations and international cooperation should be used. An overview of the auto industry

in the last two decades in our country represents the industry's growth is accelerating factor in the development of technology in the automotive industry. Since the automotive industry in the world and in our country is of particular importance, therefore, a model designed to evaluate capabilities of technology in this industry is essential for future progress. Therefore we can develop using the model proposed in specified time intervals, rather than assessing the technological capabilities of the car companies should be taken, and according to the gap in capabilities Dimensions each model improvement projects in an area of technological capabilities at Firm level and national level should be defined and implemented.



## References

- Archibugi, D., Coco, A. (2004). A New Indicator of Technological Capabilities for Developing Countries. *World Development*. 32(4)
- Inno Support Transfer – Supporting Innovations in SME. (2007), [http://www.innosupport.net/index.php?id=92&L=&tx\\_ttnews%5Btt\\_news%5D=73&tx\\_ttnews%5BbackPid%5D=74&cHash=b14221c8b7](http://www.innosupport.net/index.php?id=92&L=&tx_ttnews%5Btt_news%5D=73&tx_ttnews%5BbackPid%5D=74&cHash=b14221c8b7)
- Jafari Nejad, A. (1995). Audit and technology solutions for decreasing R&D technology, *Journal of Management Sciences in Iran*, 2
- Khamseh, A. (2011). Article, assessment of technological capabilities in the steel industry with the model of technological needs of the model, the Fourth Conference of Iranian technology Management
- Khamseh, A. (2012). Assessment of technological capabilities in the pharmaceutical industry, the second International Conference on Management technology
- Lall, S. (1992). Technological capabilities and industrialization. *World Development*, 20, 165-186
- Nasirzadeh, G. (1991). The technological and industrial development, *Devise*, 24
- Putranto, K., Steward, D. & Moore, G. (2003). International technology transfer and distribution of technology capabilities: the case of railway development in Indonesia, *Technology in society*, 25(1), 43- 53.
- Radfar, R., (2012). *Management technology and Innovation*, Science and Research Branch of Tehran, Faculty of Management
- Rnasy, F. (2011). *Technology assessment in SMEs*, Industrial Management Publications
- Tabatabaeian, S. H. (2005). Evaluation of firm-level technology capabilities, Arian publication
- Tabatabaeian, S. H. (2011). Assessment of technology capabilities at the national level, published by the Science Policy Research Center
- WIPO. (2010). *National office for technology acquisition and promotion (notap)*, basic issues in negotiating technology transfer agreements